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"Selection of Behavioral Tasks & Development of Software for Evaluation of Rhesus Monkey Behavior During Spaceflight"

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Behavior & Performance Project

I. SUMMARY OF FINDINGS: The results of several experiments were disseminated professionally during this semiannual period. These peer-reviewed papers that were accepted for publication represent the growth of our research areas, as follow-up experiments to previously published work in cognition and enrichment have been completed and are being published. The presentations not only reflect the latest interesting results that we have obtained, but also serve as a testament to the intense interest that is being expressed for our test system and findings.

A. Washburn, D. A., Harper, S., & Rumbaugh, D. M. (1994). Computer-task testing in the social milieu. Primates, 35, 343-351. (see Appendix)

B. Washburn, D. A., Rumbaugh, D. M., & Putney, R. T. (1994). Apparatus as milestones in the history of comparative psychology. Behavior Research Methods, Instruments, & Computers, 26, 231-235. (see Appendix)

C. Washburn, D. A. (In press). Stroop-Like Effects for Monkeys and Humans: Processing Speed or Strength of Association? Psychological Science.

Abstract

Stroop-like effects have been found using a variety of paradigms and subject groups. In the present investigation, 6 rhesus monkeys (Macaca mulatta) and 28 humans exhibited Stroop-like interference and facilitation in a relative numerousness task. Monkeys, like humans, processed the meanings of the numerical symbols automatically--despite the fact that these meanings were irrelevant to task performance. These data also afforded direct comparison of processing-speed versus association-strength interpretations of the Stroop effect. These findings were consistent with parallel processing models of Stroop-like interference proposed elsewhere, but not with processing-speed accounts posited frequently to explain the effect.

D. Hopkins, W. D., & Washburn, D. A., (In press). Do right- and left-handed monkeys differ on cognitive measures? Behavioral Neuroscience.

Abstract

Thirteen left- and eighteen right-handed monkeys were compared on five measures of cognitive performance (two maze-solving tasks, matching-to-sample, delayed matching-to-sample, delayed response using spatial cues, and delayed response using form cues). The

primary dependent variable was trials-to-training-criterion for each of the five tasks. Differences were found between left- and right-handed monkeys only for performance on the two versions of the delayed response task. Right-handed monkeys reached criterion significantly faster on the form-cue version of the task, whereas left-handed monkeys reached criterion significantly faster on delayed response for spatial position ($p < .05$). The results suggest that sensitive hand preference measures of laterality can reveal differences in cognitive performance, which in turn may reflect underlying laterality in functional organization of the nervous system.

E. Washburn, D. A. (1994, August). What Animal Cognition Tells Us about Human Cognition. Paper presented at the conference of the Cognitive Science Society, Atlanta, GA.

Abstract

Studies of nonhuman primate cognition are increasingly destroying the barriers that purport to distinguish humans from other animals. In the present paper, the Stroop effect is studied comparatively as one such barrier. Not only do rhesus monkeys show comparable effects to humans in a Stroop-like task, but the data from the two species taken together provide the first clear basis of support for parallel-processing, strength-of-association accounts of response competition.

F. Smith, J. D., Shields, W. E., Washburn, D. A., & Allendoerfer, K. R. (1994, August). Indifferent differences: The "Uncertain" Response in a Relational-Judgment Task. Paper presented at the 7th International Conference on Systems Research, Information, and Cybernetics, Baden-Baden, Germany.

Abstract

Rhesus monkeys and humans served in a psychophysical visual discrimination task which offered two primary responses and an escape response. Humans said that they used the escape response when they were uncertain, and the data revealed that they escaped most from trials that would otherwise have been performed at chance. Interestingly, rhesus monkeys performed in a strikingly similar fashion. The data suggest that rhesus monkeys, like humans, monitor their uncertainty and escape adaptively.

G. Washburn, D. A. (1994, August). Monkeys in Outer Space. Paper presented in the Fernbank Museum of Natural History Summer lecture Series, Atlanta, GA.

Abstract

As part of their exhibition of the American Psychological Associations "Psychology," the Fernbank Museum invited local psychologists to discuss their research. In this paper, the importance of psychological questions in spaceflight-related

research was discussed. The use of nonhuman primates, development of the Psychomotor Test System, and plans for future investigation were reviewed.

H. Washburn, D. A. (1994, July). Physical and Semantic Features in Visual Search Performance by Humans and Monkeys. Poster presented at the meeting of the American Psychological Society, Washington, DC.

Abstract

Using a computerized test system, pop-out and set-size effects were identified in visual search performance by humans and monkeys. There were clear similarities between the species in the "bottom-up" characteristics of perception, but humans exhibited unique "top-down" (i.e., semantic) effects on visual search.

II. Research Activities: The following support studies and research-related activities were undertaken within this semiannual period. Detailed summaries of each study has been provided previously.

A. Continuation of ongoing studies. As evidenced by our publications and presentations during this period, we have continued to test 9 GSU animals on a battery of tasks. These sessions contribute to the corpus of normative and support data required for our science. Experiments in learning, stimulus equivalence, attention scanning, short-term memory, motivation, and psychological well-being are ongoing.

B. Transition to BION project. We have worked to transition our project to the BION platform, searching for ways to maximize science gains. We have undertaken (and continue) thet development of preflight/postflight performance questions, the transition of PTS tasks to the footpedal, and coordination of Behavior & Performance experiments with those of muscle physiologists.

C. Foot-response training of juvenile monkeys. We received two 1-year-old rhesus monkeys from NASA and have supported their quarantine at the Sonny Carter Life Sciences Laboratory. During this period, the monkeys were trained to pull two rings, suspended overhead, in order to occupy both hands. Once both rings were simultaneously pulled, the monkeys learned that reinforcements could be obtained by pressing a joystick handle with a foot. Both monkeys have performed hundreds of trials manipulating the joystick with their feet in a simplified version of the SIDE task.

D. Support of ARRT. We provided task parameters and libraries in support of the ARRT at ARC. PTS data have been received from this test and will be analyzed in accordance with the timeframes outlined by NASA.